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Brief Report

Transcatheter closure of ventricular septal defect with Occlutech Duct Occluder

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Abstract Patent ductus arteriosus occluders are used for transcatheter closure of ventricular septal defects, as well as for closure of patent ductus arteriosus. The Occlutech Duct Occluder is a newly introduced device for transcatheter closure of patent ductus arteriosus. Here, we present a case in which the Occlutech Duct Occluder was successfully used on a patient for the closure of a perimembraneous ventricular septal defect.

Keywords: Perimembraneous ventricular septal defect; transcatheter closure; Occlutech Duct Occluder

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Until now, different devices have been used for transcatheter closure of ventricular septal defects.[1] Here, we present a case in which the Occlutech Duct Occluder (Occlutech International AB, Helsingborg, Sweden) was successfully used on a patient for the closure of a perimembraneous ventricular septal defect. The Occlutech Duct Occluder is a newly introduced device for transcatheter closure of patent ductus arteriosus.[2] To the best of our knowledge, this is the first report of the closure of ventricular septal defect using the Occlutech Duct Occluder.

Case report

A 13-year-old girl who had been followed up after being diagnosed with a ventricular septal defect was admitted to our outpatient clinic for follow-up. Evaluation of her cardiovascular system revealed a 3–4/6 pansystolic murmur in the left parasternal region. Transthoracic echocardiography showed a perimembraneous ventricular septal defect with a ventricular septal aneurysm and enlarged left cardiac chambers (Fig 1a, Supplementary video 1a). Doppler gradient across the ventricular septal defect was 95 mmHg. A decision was made to evaluate the patient through cardiac catheterisation. After obtaining informed consent from the patient's parents, cardiac catheterisation was performed under general anaesthesia. A left ventricular angiogram showed a ventricular septal defect with a ventricular septal aneurysm that had an orifice measuring 6 mm maximally during diastole (Fig 1b, Supplementary video 1b). Oximetric data revealed a pulmonary to systemic flow ratio of 1.7. The right ventricular pressure during cardiac catheterisation was 30/0–10 mmHg.

A decision was made to close the defect by using the Occlutech Duct Occluder with a short shank (7 mm) that had a proximal diameter of 8 mm and a distal diameter of 10 mm. The defect was crossed from an arterial site, and an arteriovenous loop was established. A 7 F Occlutech delivery sheath 45° was introduced from the femoral vein and passed across the defect into the left ventricle. The device was advanced through the sheath, the retention disc was delivered fully, and the device was pulled back so that the disc could be placed inside the aneurysm of the defect. After confirming the position of the disc through left ventricular angiography, the shank was delivered. The position of the device was confirmed through repeat left ventricular angiography (Fig 2a, Supplementary video 2a). A transthoracic echocardiogram showed a tiny residual flow through the device without any tricuspid or aortic regurgitation. The electrocardiogram revealed a sinus rhythm with normal conduction. The device was then released. Control angiography showed almost complete occlusion (Fig 2b, Supplementary video 2b).

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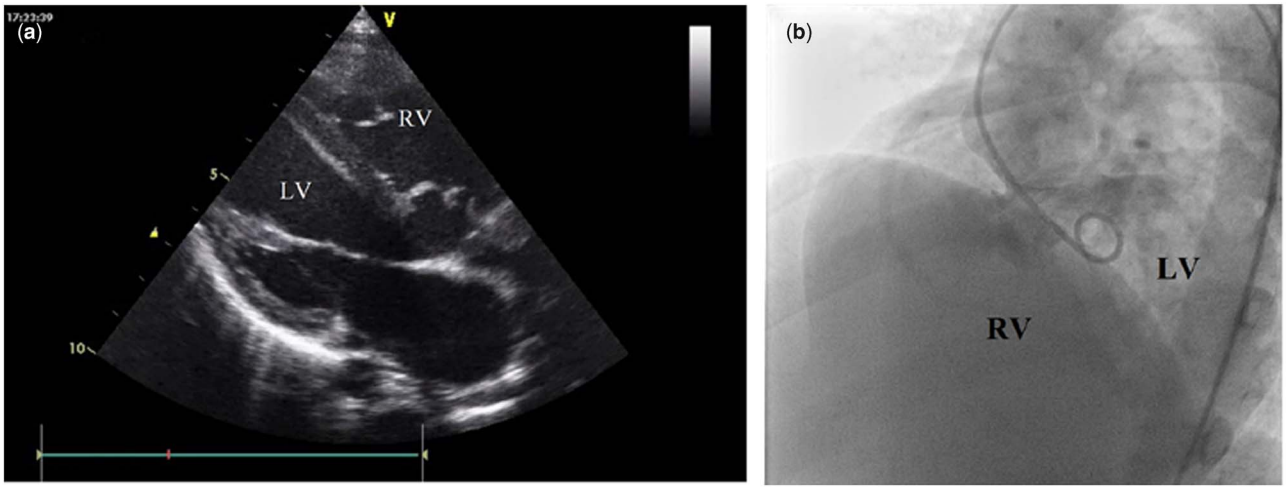

Figure 1.
*(**a**) Parasternal long-axis view demonstrating ventricular septal defect with ventricular septal aneurysm in transthoracic echocardiography; (**b**) left ventricular injection showing the ventricular septal defect with ventricular septal aneurysm. LV = left ventricle; RV = right ventricle.*

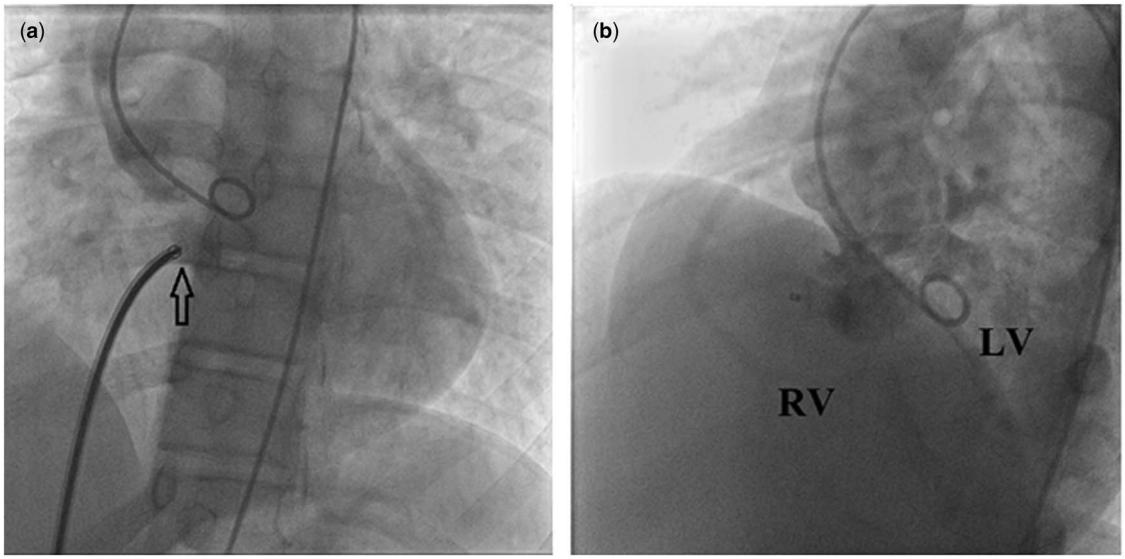

Figure 2.
*(**a**) Left ventricular angiography confirming the device position before releasing; (**b**) left ventricular angiography after releasing the device showing complete occlusion and appropriate device position. Arrow points the device. LV = left ventricle; RV = right ventricle.*

The procedure time was 80 min, and fluoroscopy time was 16.25 min.

The patient was discharged from hospital the following day, without any complications. The electrocardiogram revealed sinus rhythm with normal atrioventricular conduction. The patient continued to do well after her 5-month follow-up with normal electrocardiographic findings.

Discussion

Patent ductus arteriosus occluders have been used for transcatheter closure of ventricular septal defects, as well as for closure of patent ductus arteriosus. However, the Amplatzer Duct Occluder-I has been considered to be more advantageous, especially for defects that show aneurysm formation, because the retention disc covers the whole aneurysm.[3]

The most important difference between the Amplatzer Duct Occluder-I and the Occlutech Duct Occluder is their shank configurations (Fig 3). Although the widest part of the Amplatzer Duct Occluder shank is at the point where it is connected to the retention disc, the point where the Occlutech Duct Occluder is connected to the retention disc is its thinnest part. As a result of its structure, the Amplatzer Duct Occluder device, which is

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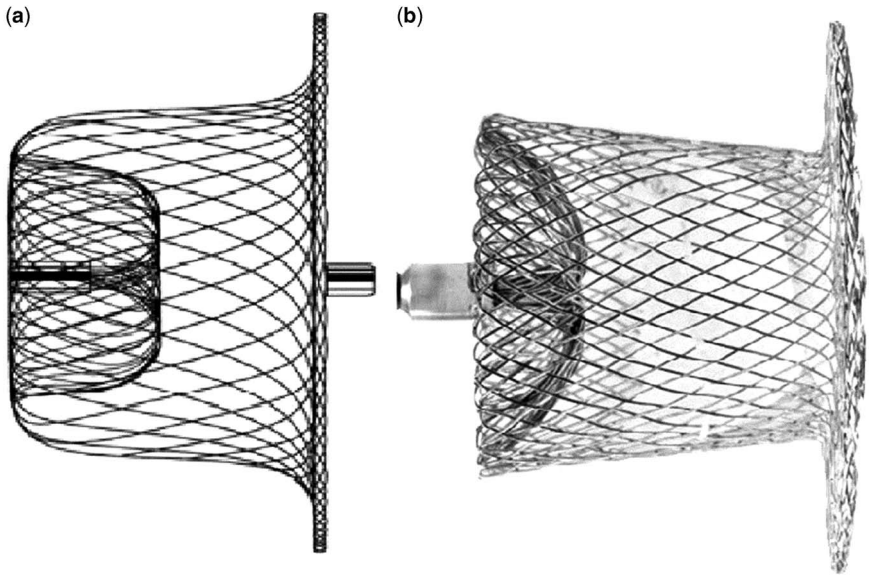

Figure 3.
*The diagrams of each device:(**a**) Amplatzer Duct Occluder-I; (**b**) Occlutech Duct Occluder.*

compressed by the edges of the ventricular septal defect, remains in the septum with the radial force caused by compression. By contrast, the part of the Occlutech Duct Occluder device that remains in the right ventricle is wider because of the structural difference. This structure, then, may help the device to hold onto the interventricular septum by acting as a retention disc. In addition, this structure may decrease the risk of atrioventricular block, because of need for less radial force than Amplatzer Duct Occluder-I. In addition, similar to the other Occlutech occluders, the lack of a distal hub may reduce the risk of thrombus formation on the left ventricular side. However, much more experience and long-term follow-up is required to make this judgement for this device.

The most important problem that we observed in transcatheter closure of ventricular septal defect with the Occlutech Duct Occluder, as compared with using an Amplatzer Duct Occluder-I, is inadequate visualisation of the device on fluoroscopy. We had to use cineangiography to perform manipulations in our patient because of inadequate visualisation on fluoroscopy, and this caused the patient to be exposed to increased amounts of radiation. Washing the device with a contrast agent and liberalising it only after obtaining adequate echocardiographic images may be helpful in overcoming this problem. Another disadvantage that can arise with the Occlutech Duct Occluder is the difficulty in using the delivery cable. As was previously noted, it is important to be careful not to dislocate the device at the time of liberalisation, because the delivery cable may create problems during this process.[4] The vise that is attached to the distal end of the cable would not grip the cable despite maximal tightening of its screw. When the vise was rotated to turn the cable, torque would not pass down the cable to release the device. As a solution, we recommend holding the cable near the sheet with a mosquito forceps and to spin the forceps around the axis of the cable.

In conclusion, the Occlutech Duct Occluder may be an alternative device for closure of a ventricular septal defect. However, the advantages and disadvantages of its use need to be validated in a large cohort of patients.

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Conflicts of Interest

None.

Ethical Standards

The authors assert that this work complies with the ethical standards of the relevant national guidelines on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.1017/S1047951117002463

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